WHAT IS CLAIMED IS:

1. An immunoconjugate comprising:

(a) a targeting moiety;

(b) a chemotherapeutic moiety; and

(c) a linker binding to the targeting moiety via a thiol group, and to the chemotherapeutic moiety via an intracellularly-cleavable moiety other than a hydrazone.

2. The immunoconjugate according to claim 1, wherein the intracellularly-cleavable moiety is cleavable by intracellular esterases.

3. The immunoconjugate according to claim 2, wherein the intracellularly-cleavable moiety is an ester moiety.

4. The immunoconjugate according to claim 3, wherein said ester moiety is the ester formed from the α-carboxylic acid of an amino acid.

5. The immunoconjugate according to claim 1, wherein the intracellularly-cleavable moiety comprises a peptide bond cleavable by intracellular enzymes.

6. The immunoconjugate according to claim 1, wherein the intracellularly-cleavable moiety comprises an ether bond, susceptible to cleavage under the acidic pH of intracellular compartments.

7. The immunoconjugate according to claim 6, wherein said ether bond is the ether bond formed between the chemotherapeutic agent and said intracellularly-cleavable moiety.

8. The immunoconjugate according to claim 7, wherein said intracellularly-cleavable moiety comprises a tetrahydropyran moiety, a tetrahydrofuran moiety or an orthoester moiety.

9. The immunoconjugate according to claim 1, wherein said linker comprises a thiol-reactive group which links to thiol groups of said targeting moiety.

10. The immunoconjugate according to claim 9, wherein said thiol-reactive group is a maleimide or vinylsulfone which links to thiol groups of said targeting moiety.

11. The immunoconjugate according to claim 1, wherein said linker comprises a thiol group which reacts with a maleimide residue at a lysine side chain of said targeting moiety.

12. The immunoconjugate according to claim 1, wherein said linker further comprises a water-solubilizing moiety between the chemotherapetic moiety and the targeting moiety.

13. The immunoconjugate according to claim 12, wherein said water-solubilizing moiety is an aminopolycarboxylate.

14. The immunoconjugate according to claim 13, wherein said aminopolycarboxylate residue is selected from the group consisting of DTPA, EDTA, TTHA, benzyl-DTPA, DOTA, benzyl-DOTA, NOTA, benzyl-NOTA, TETA and a N,N'-dialkyl substituted piperazine.

15. The immunoconjugate according to claim 1, wherein said chemotherapeutic moiety is selected from the group consisting of doxorubicin (DOX), epirubicin, morpholinodoxorubicin (morpholino-DOX), cyanomorpholino-doxorubicin (cyanomorpholino-DOX), 2-pyrrolino-doxorubicin (2-PDOX), CPT, CPT-11, SN-38, topotecan, taxanes, geldanamycin, ansamycins, and epothilones.

16. The immunoconjugate according to claim 1, wherein said targeting moiety is an antibody or an antigen binding fragment thereof.

17. The immunoconjugate according to claim 16, wherein said antibody is a monoclonal antibody (mAb).

18. The immunoconjugate according to claim 17, wherein said is a monoclonal antibody that is multivalent and/or multispecific.

19. The immunoconjugate according to claim 16, wherein said targeting moiety is a murine, chimeric, humanized, or human monoclonal antibody, and said antibody is in intact, fragment (Fab, Fab', $F(ab)_2$, $F(ab')_2$), or sub-fragment (single-chain constructs) form.

20. The immunoconjugate according to claim 18, wherein said targeting moiety is a murine, chimeric, humanized, or human monoclonal antibody, and said antibody is in intact, fragment (Fab, Fab', $F(ab)_2$, $F(ab')_2$), or sub-fragment (single-chain constructs) form.

21. The immunoconjugate according to claim 1, wherein said targeting moiety is a monoclonal antibody that is reactive with an antigen or epitope of an antigen expressed on a cancer or malignant cell.

22. The immunoconjugate according to claim 21, wherein said cancer cell is a cell from a hematopoietic tumor, carcinoma, sarcoma, melanoma or a glial tumor.

23. The immunoconjugate according to claim 1, wherein said targeting moiety is a monoclonal antibody that binds to a B-cell lineage antigen, a T-cell antigen, a myeloid lineage antigen and a HLA-DR antigen.

24. The immunoconjugate according to claim 1, wherein said targeting moiety is a monoclonal antibody that binds to an antigen selected from the group consisting of CD74, CD22, epithelial glycoprotein-1, MUC1, carcinoembryonic antigen (CEA or CD66e), colon-specific antigen-p, alpha-fetoprotein, CC49, prostate-specific membrane antigen, carbonic anhydrase IX, HER-2/*neu*, BrE3, CD19, CD20, CD21, CD23, CD33, CD45, CD74, CD80, VEGF, EGF receptor, PlGF, MUC2, MUC3, MUC4, gangliosides, HCG, EGP-2, CD37, HLA-DR, CD30, Ia, A3, A33, Ep-CAM, KS-1, Le(y), S100, PSA, tenascin, folate receptor, Thomas-Friedreich antigens, tumor necrosis antigens, tumor angiogenesis antigens, Ga 733, IL-2, IL-6, T101, MAGE, an antigen that binds to L243, CD66a (BGP), CD66b (CGM6) 66CDc (NCA), 66CDd (CGM1), anti-TAC and combinations thereof.

25. The immunoconjugate according to claim 1, wherein said targeting moiety is selected from the group consisting of LL1, LL2, hA20, 1F5, L243, RS7, PAM-4, MN-14, Mu-9, AFP-31, G250, J591, CC49 and Immu 31.

26. The immunoconjugate according to claim 1, wherein said targeting moiety is a bispecific and/or bivalent antibody construct comprising one or more antibodies selected from the group consisting of of LL1, LL2, hA20, 1F5, L243, RS7, PAM-4, MN-14, Mu-9, AFP-31, G250, J591, CC49 and Immu 31.

27. The immunoconjugate according to claim 1, wherein said targeting moiety links to at least one chemotherapeutic moiety.

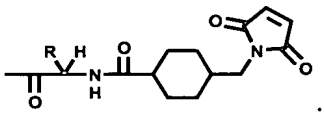
28. The immunoconjugate according to claim 27, wherein said targeting moiety links to about 7 to 12 said chemotherapeutic moieties.

29. The immunoconjugate according to claim 1, wherein said linker comprises a peptide comprising a thiol-reactive moiety at its N-terminus for linkage to the targeting moiety and one or more side chain amino groups for linkage to at least one chemotherapeutic moiety.

30. The immunoconjugate according to claim 1, wherein said linker comprises a functional group at the N-terminus, a water-solubilizing moiety at the C-terminus, and one or more internal basic amino acids with side chains available for attachment to said chemotherapeutic moiety.

31. The immunoconjugate according to claim 30, wherein said water-solubilizing moiety is selected from the group consisting of DTPA, EDTA, TTHA, benzyl-DTPA, DOTA, benzyl-DOTA, NOTA, benzyl-NOTA and N,N'-dialkyl substituted piperazine.

32. The immunoconjugate of claim 1, wherein said linker is of the formula:



33. The immunoconjugate according to claim 1, wherein said immunoconjugate is in a form suitable for parenteral administration.

34. The immunoconjugate according claim of 29, wherein said chemotherapeutic moiety is selected from the group consisting of doxorubicin (DOX), epirubicin, morpholinodoxorubicin (morpholino-DOX), cyanomorpholino-doxorubicin (cyanomorpholino-DOX), 2-pyrrolino-doxorubicin (2-PDOX), CPT, CPT-11, SN-38, topotecan, taxanes, geldanamycin, ansamycins, and epothilones.

35. The immunoconjugate according to claim 29, wherein said targeting moiety is an antibody or an antigen binding fragment thereof.

36. The immunoconjugate according to claim 35, wherein said antibody is a monoclonal antibody (mAb).

37. The immunoconjugate according to claim 36, wherein said is a monoclonal antibody that is multivalent and/or multispecific.

38. The immunoconjugate according to claim 36, wherein said targeting moiety is a murine, chimeric, humanized, or human monoclonal antibody, and said antibody is in intact, fragment (Fab, Fab', $F(ab)_2$, $F(ab')_2$), or sub-fragment (single-chain constructs) form.

39. The immunoconjugate according to claim 37, wherein said targeting moiety is a murine, chimeric, humanized, or human monoclonal antibody, and said antibody is in intact, fragment (Fab, Fab', $F(ab)_2$, $F(ab')_2$), or sub-fragment (single-chain constructs) form.

40. The immunoconjugate according to claim 29, wherein said targeting moiety is a monoclonal antibody that is reactive with an antigen or epitope of an antigen expressed on a cancer or malignant cell.

41. The immunoconjugate according to claim 40, wherein said cancer cell is a cell from a hematopoietic tumor, carcinoma, sarcoma, melanoma or a glial tumor.

42. The immunoconjugate according to claim 29, wherein said targeting moiety is a monoclonal antibody that binds to a B-cell lineage antigen, a T-cell antigen, a myeloid lineage antigen and a HLA-DR antigen.

43. The immunoconjugate according to claim 29, wherein said targeting moiety is a monoclonal antibody that binds to an antigen selected from the group consisting of CD74, CD22, epithelial glycoprotein-1, MUC1, carcinoembryonic antigen (CEA or CD66e), colon-specific antigen-p, alpha-fetoprotein, CC49, prostate-specific membrane antigen, carbonic anhydrase IX, HER-2/*neu*, BrE3, CD19, CD20, CD21, CD23, CD33, CD45, CD74, CD80, VEGF, EGF receptor, PlGF, MUC2, MUC3, MUC4, gangliosides, HCG, EGP-2, CD37, HLA-DR, CD30, Ia, A3, A33, Ep-CAM, KS-1, Le(y), S100, PSA, tenascin, folate receptor, Thomas-Friedreich antigens, tumor necrosis antigens, tumor angiogenesis antigens, Ga 733, IL-2, IL-6, T101, MAGE, an antigen that binds to L243, CD66a (BGP), CD66b (CGM6) 66CDc (NCA), 66CDd (CGM1), anti-TAC and combinations thereof.

44. The immunoconjugate according to claim 29, wherein said targeting moiety is selected from the group consisting of LL1, LL2, hA20, 1F5, L243, RS7, PAM-4, MN-14, Mu-9, AFP-31, G250, J591, CC49 and Immu 31.

45. The immunoconjugate according to claim 29, wherein said targeting moiety is a bispecific and/or bivalent antibody construct comprising one or more antibodies selected from the group consisting of of LL1, LL2, hA20, 1F5, L243, RS7, PAM-4, MN-14, Mu-9, AFP-31, G250, J591, CC49 and Immu 31.

46. The immunoconjugate according to claim 29, wherein said targeting moiety is selected from the group consisting of LL1, LL2, hA20, 1F5, L243, RS7, PAM-4, MN-14, Mu-9, Immu 31, G250, J591, CC49 and AFP.

47. The immunoconjugate according to claim 29, wherein said targeting moiety is a bispecific and/or bivalent antibody construct comprising one or more antibodies selected from the group consisting of of LL1, LL2, hA20, 1F5, L243, RS7, PAM-4, MN-14, Mu-9, Immu 31, G250, J591, and CC49.

48. The immunoconjugate according to claim 29, wherein said targeting moiety links at least one chemotherapeutic moiety.

49. The immunoconjugate according to claim 48, wherein said targeting moiety links to about 7 to 12 said chemotherapeutic moieties.

50. The immunoconjugate according to claim 30, wherein said functional group is a thiol-reactive or an amine-reactive group.

51. A method of treating a malignancy, an autoimmune disease, an infection, or an infectious lesion in a subject comprising administering to said subject a therapeutically effective amount of the immunoconjugate of claim 1.

52. The method according to claim 51, wherein said malignancy is a malignant solid tumor or hematopoietic neoplasm.

53. The method according to claim 51, wherein said immunoconjugate targets an antigen or epitope or iron-siderophore chelate receptor on a pathogen associated with said infection or infectious lesion.

54. The method according to claim 53, wherein said pathogen is selected from the group consisting of a bacterium, fungus, virus, rickettsia, mycoplasma and protozoa.

55. The method according to claim 53, wherein said pathogen is selected from the group consisting of *Streptococcus agalactiae*, *Legionella pneumophilia*, *Streptococcus pyogenes*, *Escherichia coli*, *Neisseria gonorrhosae*, *Neisseria meningitidis*, *Pneumococcus*, *Hemophilis influenzae B*, *Treponema pallidum*, Lyme disease spirochetes, *Pseudomonas aeruginosa*, *Mycobacterium leprae*, *Brucella abortus*, mycobacterium tuberculosis, rabies virus, influenza virus, cytomegalovirus, herpes simplex virus I, herpes simplex virus II, human serum parvo-like virus, respiratory syncytial virus, varicella-zoster virus, hepatitis B virus, measles virus, adenovirus, human T-cell leukemia viruses, Epstein-Barr virus, murine leukemia virus, mumps virus, vesicular stomatitis virus, sindbis virus, lymphocytic choriomeningitis virus, wart virus, blue tongue virus, Sendai virus, feline leukemia virus, reo virus, polio virus, simian virus 40, mouse mammary tumor virus, dengue virus, rubella virus, *Plasmodium falciparum*, *Plasmodium vivax*, *Toxoplasma gondii*, *Trypanosoma rangeli*, *Trypanosoma cruzi*, *Trypanosoma rhodesiensei*, *Trypanosoma brucei*, *Schistosoma mansoni*, *Schistosoma japanicum*, *Babesia bovis*, *Elmeria tenella*, *Onchocerca volvulus*, *Leishmania tropica*, *Trichinella spiralis*, *Theileria parva*, *Taenia hydatigena*, *Taenia ovis*, *Taenia saginata*, *Echinococcus granulosus*, *Mesocestoides corti*, *Mycoplasma arthritidis*, *M. hyorhinis*, *M. orale*, *M. arginini*, *Acholeplasma laidlawii*, *M. salivarium* and *M. pneumoniae*.

56. The method according to claim 51, wherein said autoimmune disease is a class III autoimmune disease.

57. The method according to claim 56, wherein said class III autoimmune disease is selected from the group consisting of immune-mediated thrombocytopenias, dermatomyositis, Sjögren's syndrome, multiple sclerosis, Sydenham's chorea, myasthenia gravis, systemic lupus erythematosus, lupus nephritis, rheumatic fever, rheumatoid arthritis, polyglandular syndromes, bullous pemphigoid, diabetes mellitus, Henoch-Schonlein purpura, post-streptococcal nephritis, erythema nodosum, Takayasu's arteritis, Addison's disease, rheumatoid arthritis, sarcoidosis, ulcerative colitis, erythema multiforme, IgA nephropathy, polyarteritis nodosa, ankylosing spondylitis, Goodpasture's syndrome, thromboangitis ubiterans, primary biliary cirrhosis, Hashimoto's thyroiditis, thyrotoxicosis, scleroderma, chronic active hepatitis, polymyositis/dermatomyositis, polychondritis, pamphigus vulgaris, Wegener's granulomatosis, membranous nephropathy, amyotrophic lateral sclerosis, tabes

dorsalis, giant cell arteritis/polymyalgia, pernicious anemia, rapidly progressive glomerulonephritis and fibrosing alveolitis.

58. The method of claim 51, wherein said immunoconjugate is administered parenterally.

59. The method of claim 51, wherein said targeting moiety is a monoclonal antibody that binds to a B-cell lineage antigen, a T-cell antigen, a myeloid lineage antigen and a HLA-DR antigen.

60. The method according to claim 51, wherein said targeting moiety is a monoclonal antibody that binds to an antigen selected from the group consisting of CD74, CD22, epithelial glycoprotein-1, MUC1, carcinoembryonic antigen (CEA or CD66e), colon-specific antigen-p, alpha-fetoprotein, CC49, prostate-specific membrane antigen, carbonic anhydrase IX, HER-2/*neu*, BrE3, CD19, CD20, CD21, CD23, CD33, CD45, CD74, CD80, VEGF, EGF receptor, PlGF, MUC2, MUC3, MUC4, gangliosides, HCG, EGP-2, CD37, HLA-DR, CD30, Ia, A3, A33, Ep-CAM, KS-1, Le(y), S100, PSA, tenascin, folate receptor, Thomas-Friedreich antigens, tumor necrosis antigens, tumor angiogenesis antigens, Ga 733, IL-2, IL-6, T101, MAGE, an antigen that binds to L243, CD66a (BGP), CD66b (CGM6) 66CDc (NCA), 66CDd (CGM1), anti-TAC and combinations thereof.

61. The method according to claim 51, wherein said targeting moiety is selected from the group consisting of LL1, LL2, hA20, 1F5, L243, RS7, PAM-4, MN-14, Mu-9, AFP-31, G250, J591, CC49 and Immu 31.

62. The method according to claim 51, wherein said targeting moiety is a bispecific and/or bivalent antibody construct comprising one or more antibodies selected from the group consisting of of LL1, LL2, hA20, 1F5, L243, RS7, PAM-4, MN-14, Mu-9, AFP-31, G250, J591, CC49 and Immu 31.